

## Analytical Data Quality Control Report

### Second Quarter 2006

Analytical data verification is summarized in Section 3.0 of the report. This appendix provides additional details.

#### Quality Assurance Objectives

Quality assurance objectives are the broad goals for data collection and review. The following quality assurance objectives are described below: precision, accuracy, representativeness, completeness and comparability (PARCC).

- **Precision (P):** Precision is defined as the degree of reproducibility of the measurements under a given set of conditions. Precision is documented on the basis of replicate/duplicate analyses: usually laboratory duplicate, laboratory control sample duplicates or matrix spike duplicates.
- **Accuracy (A):** Accuracy is defined as the bias in a measurement system. Accuracy is documented on the basis of recovery of surrogates, laboratory control samples, and matrix spikes.
- **Representativeness (R):** Representativeness is defined as the degree to which data represent a characteristic of a set of samples. The representativeness of the analytical data is a function of the procedures and carefulness used in procuring and processing the samples. The representativeness can be documented by the relative percent difference between separately procured, but otherwise identical sample aliquots.
- **Completeness (C):** The completeness objective for an analysis is to provide sufficient data of the acceptable quality such that the goals of the analytical project can be achieved. The overall project completeness is expressed as the percentage of planned data that is usable for its intended purpose.
- **Comparability (C):** The comparability objective is to provide analytical data for which the accuracy, precision, representativeness, completeness and detection limit are similar to these quality indicators for data generated by other laboratories for similar samples. The comparability objectives is documented by inter-laboratory studies carried out by regulatory agencies or carried out for specific projects or contracts; and by comparison of periodically generated statements of accuracy, precision and detection limits with those of other laboratories.

These PARCC data quality objectives were evaluated during the data review process. The process of data review also included a completeness check to ensure that all data has been properly loaded into the database that will be used for report generation. Data that failed to meet the data quality assurance objectives for the project have been qualified as to usability and potential low or high bias during the review process. Data was reviewed against the project specific limits provided in the QAPP. Data review followed the basic

guidance provided in the National Functional Guidelines for Data Review (<http://www.epa.gov/superfund/programs/clp/guidance.htm>) unless the QAPP or other project specific document specified otherwise.

### **Field Quality Control Samples**

Quality control samples collected during the Yerington Air Quality investigation included trip blanks, field blanks and field duplicates.

- **Trip Blanks:** Trip blanks are used to evaluate representativeness by identifying any compounds that may have been introduced to the samples during shipment, handling, or storage on site and at the laboratory. The trip blanks are clean filters that are shipped to the field and then shipped back to the laboratory, and are never opened in the field. For the 14 sampling events, 11 trip blanks were collected. All of these trip blanks were analyzed for metals, mercury and radiochemicals. Three of these filters were associated with PM<sub>10</sub> locations; therefore they were also analyzed for particulate matters less than 10 microns (PM<sub>10</sub>). The remaining eight were associated with TSP locations and thus analyzed for total suspended particulates (TSP).
- **Field Blanks:** Field blanks are used to evaluate representativeness by identifying any potential contamination from field procedures or insufficient decontamination. For the 14 sampling events, 12 field blanks were collected. All of these filters were analyzed for metals, mercury and radiochemicals. The nine filters that were associated with TSP locations were also analyzed for TSP, and the three remaining filters that were associated with PM<sub>10</sub> locations were analyzed for PM<sub>10</sub>.
- **Field Duplicates:** Field duplicates are two samples collected at the same time from the two locations that are right next to each other, and which are submitted to the laboratory as separate samples (i.e., "blind" duplicates). Field duplicate samples can be used to assess the heterogeneity of compounds within the sample matrix and the consistency of the overall sampling effort, including collection, shipping, and analysis; the purpose of submitting them "blind" is to assess the consistency or precision of the laboratory's analytical system. Field duplicate samples were analyzed for the same parameters as the corresponding primary sample.

### **Data Review Procedures**

As part of the presentation of analytical results, it is important to inform the data users of any results that failed to meet the Data Quality Objectives (DQOs) as established in the Work Plan and Quality Assurance Project Plan (QAPP). Laboratory data for this project was assessed through internal verification. Laboratory results that met all the DQOs have been accepted without qualification. Results associated with QC parameters that did not meet objectives have been qualified as estimated (J flagged) or rejected as unusable for any purpose (R flagged). Data qualified as estimated is considered usable for its intended purpose. However, the data user should be aware that the reported result may not be accurate or precise. Internal data verification was based on the same QA/QC parameters

as data validation, except that raw data record reviews and recalculation of results from the raw data were not performed during verification. Verification was performed internally on the total amount of data produced. The components of data verification are presented in Table H-1.

<b>Table H-1. Data Verification Requirements</b>	
<b>Review Item</b>	<b>Checked During Data Verification</b>
Case Narrative	X
Chain-of-Custody Documentation	X
Summary of Results	X
Holding Times	X
Method Blank Analysis Results	X
Field/Trip Blank Analysis Results	X
Surrogate Standard Percent Recoveries (%R)	X
Laboratory Control Samples (LCS) - %R	X
LCS/LCS Duplicate (LCSD) - Relative Percent Difference (RPD)	X
Field Duplicate (FD) - RPD	X

During the evaluation of the data, qualifiers were assigned, if necessary. The valid data qualifiers that were added to the data when necessary are defined below.

- U – Analyte not detected at the detection limit concentration.
- J – Reported value is an estimated concentration.
- UJ – Analyte not detected at an estimated detection limit concentration.
- R – This data was rejected and was not used for any purposes.
- UR – The analyte was not detected. The detection limit is unreliable and may be representative of a false negative. This data was rejected and is not usable for any purpose.

#### **Data Quality Summary and Analytical Completeness**

Individual analytical results were qualified during the data verification procedures. The percentage of results that are qualified as estimated or rejected due to QC deficiencies is an indication of the overall data quality for a given analytical method.

The following issues described below affected the general quality of the data.

- **Field/Trip Blank Contamination:** 385 results were qualified as not detected with an estimated detection limit due to field and trip blank contamination. Compounds mostly affected by these contaminations were mercury (117 results were qualified), vanadium (90), radium-228 (45), and thorium-230 (49). It is worth noting that out of the 23 trip/field blanks, 21 had iron, 17 had mercury, 12 had thorium-230, 10 had vanadium and 9 had radium-228 contamination.

- **Method blank Contamination:** 218 results were qualified as not detected with an estimated detection limit due to method blank contamination. Compounds mostly affected by these contaminations were mercury (53 results were qualified), vanadium (72), radium-228 (25) and thorium-230 (48).
- **Relative Percent Difference (RPD):** Two primary/field duplicate sample pairs had an RPD higher than the 60% limit for one compound (thorium-230 and PM-10) each. These four results were qualified as estimated.
- **Calibration Blank Problems:** A 37 results (beryllium, cadmium, mercury and silver) were qualified as not detected with an estimated detection limit due to initial and continuing calibration blank problems.

Table H-2 provides a summary of the number of results that were qualified by method.

Method	Parameter	Samples Analyzed (N+FD)	Analytes per sample	Number of results				Completeness	
				Total	Rejected	Estimated due to QC deficiencies	Estimated due to >MDL but <PQL	Percent usable	Percent quantitative*
40CFRJ	PM10	83+13	1	96	0	2	0	100%	98%
40CFRB	TSP	81	1	81	0	0	0	100%	100%
SW6010B	Metals by ICP/AES	164+13	5	885	0	22	286	100%	97%
SW6020	Metals by ICP/MS	164+13	15	2655	0	168	512	100%	94%
SW7471A	Mercury	164+13	1	177	0	120	48	100%	32%
E900	Gross alpha & beta	164+13	2	354	0	14	41	100%	96%
E903.1	Radium-226	164+13	1	177	0	2	7	100%	99%
E904	Radium-228	164+13	1	177	0	61	5	100%	66%
E908	Isotopic uranium	164+13	3	531	0	0	13	100%	100%
ISOTH	Isotopic thorium	164+13	3	531	0	66	71	100%	88%
* Note: Estimations due solely to results <PQL do not affect the calculated completeness Calculations do not include any required field or laboratory QC samples, except field duplicates. N = normal environmental samples      FD = field duplicate samples									

Overall, the data is of great quality. 100% of it is usable, which is well above the 80% goal. A high percentage of the mercury (68%) and vanadium (55%) results were qualified as not detected with an estimated detection limit due to blank contamination. Remaining low level detections of these analytes may be false positives and should be used with caution.